

THE SCIENTIFIC INSTRUMENTS, APPLIANCES AND APPARATUS TRADE

Note.—For information regarding the scope of the Census, instructions given to firms for making returns, and definitions of the terms used in this report, reference should be made to the Introductory Notes on pages v to xviii.

Introductory

This trade comprises firms that were engaged wholly or mainly in the manufacture of scientific instruments, appliances and apparatus. The following table shows the main results of the Censuses of 1930 and 1924 in respect of firms in Great Britain that employed an average of more than ten persons :—

Particulars	Unit	1930	1924
Value of goods made and work done (Gross output)	£'000	9,964	9,092
Cost of materials used	,,	3,944	4,011
Paid for work given out to other firms	,,	23	23
Net output	,,	5,997	5,058
Average number of persons employed (excluding outworkers)...	No.	25,230	23,778
Net output per person employed (excluding outworkers)	£	238	213
Power available :—			
Prime movers	H.P.	4,524	4,631
Electric motors driven by purchased electricity	,,	13,418	11,106
Number of returns	No.	306	328
Number of establishments	,,	356	*

* Not available.

Deficiencies in 1930 aggregates.—The aggregate number of persons employed in 1930 by firms that stated that they employed not more than ten persons on the average was 2,910, the corresponding figure for 1924 being 1,743.* The value of the gross output of the small firms in 1924 was £516,000,* and particulars of the items included in this figure are given below :—

Optical instruments and appliances	£'000	119
Dental, surgical, medical and veterinary instruments and appliances (other than optical)	137	
Surgical and medical bandages and dressings	16	
Photographic apparatus and appliances	21	
Barometers, thermometers, hydrometers and similar instruments	31	
Mathematical instruments, slide rules, calculating discs and cylinders	17	
Gauges, precision balances and other scientific instruments and appliances	46	
Electrical instruments and apparatus	12	
Photographic printing, map-mounting, etc.	16	
Other goods made	9	
Repair work	80	
Other work done	12	
TOTAL		516

* These figures include particulars relating to the few firms in Northern Ireland, for which separate information is not available for publication.

In addition, 66 firms to which schedules were sent at the 1930 Census and 130 at that of 1924 furnished no information; these firms either had small businesses or had ceased productive operations before the end of the censal year.

Size of firms.—In the following table the main particulars recorded at the Census of 1930 are grouped according to the average numbers of persons shown in the returns:—

Size of firm (average numbers employed)	Number of returns	Gross output	Net output	Average number of persons employed (excluding outworkers)	Net output per person employed
	No.	£'000	£'000	No.	£
11-24 ...	104	619	377	1,792	210
25-49 ...	77	931	605	2,711	223
50-99 ...	54	1,343	854	3,637	235
100-199 ...	43	2,107	1,250	5,966	210
200-299 ...	17	1,818	1,094	4,221	259
300-399 ...	4	527	332	1,387	239
400 and over ...	7	2,619	1,485	5,516	269
TOTAL ...	306	9,964	5,997	25,230	238

Regional distribution.—In the following table the results recorded at the Censuses of 1930 and 1924 are grouped according to the principal areas* of Great Britain in which firms in this trade are situated:—

Area	Number of returns	Gross output	Net output	Average number of persons employed (excluding outworkers)	Net output per person employed	
	No.	£'000	£'000	No.	£	
1	1930	187	6,560	4,023	15,298	262
	1924	210	5,718	3,195	14,317	223
2	1930	26	597	307	1,639	187
	1924	26	778	374	1,835	204
3	1930	14	370	234	1,424	164
	1924	21	361	270	1,520	178
5	1930	24	595	373	2,140	174
	1924	29	640	385	2,063	187
6	1930	28	1,340	705	2,932	240
	1924	16	1,227	592	2,571	230
4 and 7	1930	8	57	29	160	178
	1924	7	39	21	148	142
9	1930	13	410	303	1,479	205
	1924	13	301	198	1,213	163
10	1930	6	35	23	158	144
	1924	6	28	23	111	207
TOTAL...	1930	306	9,964	5,997	25,230	238
	1924	328	9,092	5,058	23,778	213

* For particulars see page xviii.

Northern Ireland.—Owing to the risk of disclosing particulars relating to individual firms, separate details of the production of scientific instruments, etc., in Northern Ireland were not published for either 1930 or 1924. The particulars were included with those of some other small trades to form a miscellaneous group (see page 200).

Sub-divisions of the industry.—In the following table the results obtained at the 1930 Census are classified in five groups, each of which comprises returns in which the principal output was of the kind specified in the first column. Corresponding information for 1924 is not available in similar detail.

Group.	Number of returns	Gross output	Value of charac- teristic prod- ucts	Net output	Average number of persons em- ployed (exclud- ing out- workers)	Net output per person em- ployed
	No.	£'000	£'000	£'000	No.	£
Spectacles, pince-nez, etc. ...	69	1,311	1,227	781	3,942	198
Other optical instruments and appliances ...	10	495	392	398	1,686	236
Sensitised photographic paper, plates and films ...	17	2,869	2,522	1,450	4,492	323
Other photographic apparatus and appliances ...	19	426	372	272	1,499	182
Other scientific instruments, appliances and apparatus (including repairs and work done for the trade) ...	191	4,863	4,279	3,096	13,611	227
TOTAL ...	306	9,964	8,792	5,997	25,230	238

Production

Principal products.—The following table shows the value of scientific instruments, appliances, etc., made in 1930 and 1924:—

Kind of goods	1930				1924
	Returned on schedules for				Total
	The Scientific Instruments, etc. Trade		All trades		
	Value	Entries	Value	Entries	
£'000	No.	£'000	No.	£'000	
Optical instruments and appliances :—					
Lenses (other than spectacle lenses), prisms, etc., optically worked, sold separately	97	13	97	13	316*
Telescopes, binoculars and microscopes	143	19	143	19	95
Spectacles, pince-nez, etc. :—					
Complete	478	48	478	48	563†
Spectacle lenses, sold separately	426	50	426	50	
Frames, mounts and other parts, sold separately	331	48	333	49	
Complete and parts, not separately distinguished	29	5	47	6	
Other optical instruments and appliances (other than photographic) ...	252	30	257	31	166
TOTAL—Optical instruments and appliances (other than photographic) ...	1,756	...	1,781	...	1,140
Dental, surgical, medical and veterinary instruments and appliances (other than optical) :—					
Instruments	283	35	283	35	187
Appliances, including trusses and artificial limbs	688	48	690	51	818
Aseptic hospital furniture	103	17	112	20	61
Surgical and medical bandages and dressings	686	16	1,884	45	1,651
Other sorts, including general dental goods (except dental platinum) ...	500	21	531	25	477
TOTAL—Dental, surgical, medical and veterinary instruments and appliances	2,260	...	3,500	...	3,194
Photographic apparatus and appliances :—					
Cameras, complete (including cinematograph cameras) <i>Thousand</i>	405	12	415	13	132
	1,060		1,086		121
Cinematograph and projection apparatus (including magic lanterns) ...	169	13	218	18	55
Sensitised photographic paper	1,211	16	1,252	18	827
Sensitised photographic plates and films (including blank cinematograph films)	1,333	10	1,333	10	1,107
Other photographic and cinematograph appliances (other than lenses), not elsewhere specified ...	95	23	114	28	56
TOTAL—Photographic apparatus and appliances	3,213	...	3,332	...	2,177

Kind of goods	1930				1924
	Returned on schedules for				Total
	The Scientific Instruments, etc. Trade		All trades		
	Value	Entries	Value	Entries	
£'000	No.	£'000	No.	£'000	
Barometers, thermometers, hydrometers and similar instruments	510	34	519	37	335
Precision balances	19	5	19	5	19
Gauges	88‡	14	180	23	104‡
Mathematical instruments	174	14	182	15	424
Slide rules, calculating discs and cylinders	6	6	6	6	7
Land surveying instruments, not elsewhere included	109	11	109	11	878
Nautical instruments, not elsewhere included	219	13	219	13	
Instruments for scientific research and experiment, not elsewhere included ...	70	16	70	16	
Other and unclassified scientific instruments and apparatus (other than electrical instruments, electro-medical apparatus and wireless valves and apparatus§)	755	54	1,114	72	
TOTAL—PRINCIPAL PRODUCTS ...	9,179	...	11,031	...	8,278

* Including spectacle lenses sold separately.

† Excluding spectacle lenses, sold separately, which are included with "Lenses, prisms, etc." above.

‡ Of which 44,335 were valued at £49,000 in 1930 and 105,312 at £66,000 in 1924.

§ For electrical instruments, etc., see the report on the Electrical Engineering Trade which forms part of a separate volume (Part II).

Prices.—As a result of the considerable increase in the output of the cheaper varieties of cameras, the average selling value of cameras of all kinds declined from 21s. 10d. in 1924 to 7s. 8d. in 1930. The partial information available for gauges indicates a rise in average value from 12s. 7d. to 21s. 11d. Owing to the lack of quantitative particulars, average values cannot be calculated for other classes of goods manufactured by this trade.

Volume of production in 1930 and 1924.—The absence of price data renders it impracticable to attempt any precise and detailed comparison of the volume of production of scientific instruments, appliances and apparatus in 1930 and 1924, but such information as is available indicates that the total value of the output of these products in 1924 (£8,278,000) would be equivalent to a sum of about £7,800,000 if re-valued in terms of 1930 prices. The total value recorded for similar products for 1930, viz., £11,031,000, was in excess of this estimate by 41 per cent.

Production, exports and imports.—The following table shows, in relation to production, the values of the principal classes of

scientific instruments exported from the United Kingdom in 1930 and 1924, together with the values of similar goods imported and retained. As regards the 1930 figures of production, the deficiencies referred to on page 235 of this report should be borne in mind; the figures for 1924 include the output of the small firms and of the few firms in Northern Ireland.

The production figures represent values "at factory", exports are stated f.o.b. and retained imports c.i.f., and these different bases of valuation should be borne in mind in comparing the figures given under these headings.

Kind of goods	Production	Exports	Retained imports
	£'000	£'000	£'000
Optical instruments and appliances ...	1,781	116	213
... { 1930			
... { 1924	1,259	78	265
Dental, surgical, medical and veterinary instruments and appliances (except optical) :—			
Instruments	283	83	6
... { 1930			
... { 1924	206	102	36
Appliances, including trusses and artificial limbs	690	129	†
... { 1930			
... { 1924	913	126	12
Aseptic hospital furniture	112	19	4
... { 1930			
... { 1924	65	15	15
Other sorts, including general dental goods (except dental platinum) but excluding surgical and medical bandages	531	210	127
... { 1930			
... { 1924	496	198	§
Photographic :—			
Cameras, complete (including cinematograph cameras)	415	23*	‡
... { 1930			
... { 1924	133	36*	128*
Cinematograph and projection apparatus (including magic lanterns)	218	27*	66*
... { 1930			
... { 1924	57	14*	27*
Sensitised photographic paper	1,252	468	93
... { 1930			
... { 1924	336	335	110
Sensitised photographic plates and films and blank cinematograph films	1,333	489	755
... { 1930			
... { 1924	1,107	580	782
Other photographic and cinematograph appliances, not elsewhere specified (excluding photographic chemicals and exposed films)	114	129	194
... { 1930			
... { 1924	65	108	64
Precision balances 	19	9	14
... { 1930			
... { 1924	20	7	5
Gauges	180	20	43
... { 1930			
... { 1924	120	18	18
Mathematical instruments 	182	27	11
... { 1930			
... { 1924	441	53	9
Slide rules, calculating discs and cylinders 	6	1	3
... { 1930			
... { 1924	10	¶	3

† Re-exports in excess of imports by £69,000.

§ Re-exports in excess of imports by £107,000.

* Excluding lenses.

‡ Re-exports in excess of imports by £6,000.

|| Parts are included in the figures for overseas trade.

¶ Less than £500.

Exports of cameras numbered 22,000 in 1930 and 30,000 in 1924. In the earlier year retained imports numbered 385,000 but in 1930 re-exports exceeded imports by 184,000. From the average values of imports and re-exports in 1930 it is clear that the re-exports consisted mainly of cameras imported prior to that year. It would appear that in 1930 all but a negligible proportion of the cameras available for use in the United Kingdom were of British manufacture; in 1924 only 19 per cent. were of British manufacture.

Imports of optical glass and optical instruments were liable to Key Industry Duty at the rate of 33½ per cent. *ad valorem* in 1924; in 1930 the rate of duty was 50 per cent. *ad valorem*.

Repairs and work done for the trade.—The total amount recorded under these headings for 1930 was £236,000 (including £192,000 for repair work) and for 1924, £299,000 (including £237,000 for repair work).

Other products.—In addition to the output shown in the table of principal products on pages 238-9, the following goods were produced in 1930 and 1924 by firms that made their returns on schedules for the Scientific Instruments, Appliances and Apparatus Trade. These goods are dealt with in the reports on those trades in which the principal output was recorded.

Kind of goods	1930	1924
	£'000	£'000
Electrical goods and apparatus :—		
Electrical instruments, scientific	154	319
X-ray and other electro-medical apparatus and wireless apparatus	36	} 527
Other electrical goods and apparatus	34	
Total—Electrical goods and apparatus	224	846
Machinery and accessories and other manufactures of metal	118	109
Manufactures of wood	18	97
Printing, engraving and manufactures of paper and cardboard	76	21
Other goods made	113	65
TOTAL—Other products	549	1,138

Employment and Wages

Employment.—The following table shows the average numbers of persons employed in 1930 and 1924 :—

Persons employed	Males		Females		Total	
	Under 18	All ages	Under 18	All ages	Under 18	All ages
1930						
Operatives (average for the year)	2,415	13,864	2,135	7,215	4,550	21,079
Administrative, technical and clerical staff (as at 18th October)	232	2,537	298	1,614	530	4,151
TOTAL	2,647	16,401	2,433	8,829	5,080	25,230
1924						
Operatives (average for the year)	2,135	12,313	2,652	7,935	4,787	20,248
Administrative, technical and clerical staff (as at 18th October)	163	2,189	214	1,341	377	3,530
TOTAL	2,298	14,502	2,866	9,276	5,164	23,778
Average number of outworkers :-						
1930... ..	42		7		49	
1924... ..	17		21		38	

Wages.—The available information as to the amount of wages paid in 1930 and 1924 is given on pages 210 and 211.

Power

The following table shows the capacity of prime movers, electric generators and electric motors ordinarily in use and in reserve or idle in 1930 and 1924 :—

Power equipment	1930			1924		
	Ordinarily in use	In reserve or idle	Total	Ordinarily in use	In reserve or idle	Total
PRIME MOVERS	H.P.	H.P.	H.P.	H.P.	H.P.	H.P.
Reciprocating steam engines	1,936	70	2,006	1,630	108	1,738
Steam turbines	365	—	365	50	—	50
Internal combustion engines :—						
Gas	771	55	826	1,580	321	1,901
Petrol, kerosene, or other light oils	—	6	6	32	—	32
Heavy oils	951	370	1,321	435	400	835
Water engines	—	—	—	75	—	75
TOTAL	4,023	501	4,524	3,802	829	4,631

Power equipment	1930			1924		
	Ordinarily in use	In reserve or idle	Total	Ordinarily in use	In reserve or idle	Total
ELECTRIC GENERATORS	Kw.	Kw.	Kw.	Kw.	Kw.	Kw.
Driven by						
Reciprocating steam engines	1,196	—	1,196	726	23	749
Steam turbines	250	—	250	35	—	35
Internal combustion engines :—						
Gas	210	29	239	512	88	600
Heavy oils	420	40	460	295	335	630
Water engines	—	—	—	33	—	33
TOTAL	2,076	69	2,145	1,601	446	2,047
ELECTRIC MOTORS	H.P.	H.P.	H.P.	H.P.	H.P.	H.P.
Driven by						
Electricity generated in same works	2,316	22	2,338	2,023	83	2,106
Purchased electricity	12,026	1,392	13,418	9,996	1,110	11,106
TOTAL	14,342	1,414	15,756	12,019	1,193	13,212

Consumption of fuel

The following table shows the quantities of coal, coke and electricity recorded as used in 1930 :—

Kind of fuel used	For power (driving engines)	For other purposes (so far as recorded)	For power and other purposes, not separately distinguished
	Tons	Tons	Tons
Coal	1,607	6,950*	9,573
Coke	71	4,087*	—
Electricity used for all purposes :—			B.T.U. (Kw.-hrs.) '000
Generated in same works			3,025
Purchased			9,990
TOTAL—Electricity			13,015

* These figures were recorded by firms representing 86·8 per cent. of the net output of the whole trade.

TABLES

I. Summary of results

Particulars	Unit	England and Wales	Scotland	Great Britain
Value of goods made and work done (Gross output)	£'000	9,519	445	9,964
Cost of materials used	"	3,825	119	3,944
Paid for work given out to other firms	"	23	*	23
Net output	"	5,671	326	5,997
Average number of persons employed (excluding outworkers)	No.	23,593	1,637	25,230
Net output per person employed (excluding outworkers)	£	240	199	238
Power available :—				
Prime movers	H.P.	4,473	51	4,524
Electric motors driven by purchased electricity	"	11,542	1,876	13,418

* Less than £500.

II. Production

Kind of goods made and work done	England and Wales	Scotland	Great Britain
Optical instruments and appliances :—	£'000	£'000	£'000
Lenses (other than spectacle lenses), prisms, etc., optically worked, sold separately	97	—	97
Telescopes, binoculars and microscopes	*	*	143
Spectacles, pince-nez, etc. :—			
Complete	*	*	478
Spectacle lenses, sold separately	*	*	426
Frames, mounts and other parts, sold separately	*	*	331
Complete and parts, not separately distinguished	29	—	29
Other optical instruments and appliances (other than photographic)	*	*	252
TOTAL—Optical instruments and appliances	1,587	169	1,756
Dental, surgical, medical and veterinary instruments and appliances (other than optical) :—			
Instruments	281	2	283
Appliances, including trusses and artificial limbs	685	3	688
Aseptic hospital furniture	*	*	103
Surgical and medical bandages and dressings	*	*	686
Other sorts, including general dental goods (except dental platinum)	*	*	500
TOTAL—Dental, surgical, medical and veterinary instruments and appliances	2,230	30	2,260

Kind of goods made and work done	England and Wales	Scotland	Great Britain
Photographic apparatus and appliances :—	£'000	£'000	£'000
Cameras, complete (including cinematograph cameras)	405†	—	405†
Cinematograph and projection apparatus (including magic lanterns)	169	—	169
Sensitised photographic paper	1,211	—	1,211
Sensitised photographic plates and films (including blank cinematograph films)	1,333	—	1,333
Other photographic and cinematograph appliances (other than lenses), not elsewhere specified	95	—	95
TOTAL—Photographic apparatus and appliances	3,213	—	3,213
Barometers, thermometers, hydro-meters and similar instruments	*	*	510
Precision balances	*	*	19
Gauges	*	*	88‡
Mathematical instruments	174	—	174
Slide rules, calculating discs and cylinders	6	—	6
Land surveying instruments, not specified above	109	—	109
Nautical instruments, not elsewhere included	139	80	219
Instruments for scientific research and experiment, not elsewhere included	70	—	70
Other and unclassified scientific instruments and apparatus (other than electrical instruments, electro-medical apparatus and wireless valves and apparatus)	744	11	755
TOTAL—Scientific instruments, appliances and apparatus (other than electrical)	8,857	322	9,179
Electrical goods and apparatus :—			
Electrical instruments, scientific	*	*	154
X-ray and other electro-medical apparatus and wireless apparatus	*	*	36
Other electrical goods and apparatus	34	—	34
Machinery and accessories and other metal manufactures	118	—	118
Manufactures of wood	18	—	18
Printing, engraving and manufactures of paper and cardboard	76	—	76
Other goods made	113	—	113
Repair work	162§	30§	192§
Work done for the trade	38§	6§	44§
TOTAL VALUE OF GOODS MADE AND WORK DONE (GROSS OUTPUT)	9,519	445	9,964

* Owing to the possible disclosure of information relating to individual firms, figures can only be given for Great Britain as a whole.

† The number of complete cameras recorded was 1,060,000.

‡ Of which £49,000 was recorded as the value of 44,335 gauges.

§ Amount received for work done.

III. Employment

A.—NUMBERS EMPLOYED IN WEEK ENDED 18TH OCTOBER, 1930
(EXCLUDING OUTWORKERS)

Persons employed (excluding outworkers)	Males		Females		Males and females	
	Under 18	All ages	Under 18	All ages	Under 18	All ages
<i>England and Wales :—</i>						
Operatives	2,213	12,469	2,019	6,890	4,232	19,359
Administrative, etc.* ...	216	2,346	278	1,484	494	3,830
TOTAL	2,429	14,815	2,297	8,374	4,726	23,189
<i>Scotland :—</i>						
Operatives	155	1,129	75	185	230	1,314
Administrative, etc.* ...	16	191	20	130	36	321
TOTAL	171	1,320	95	315	266	1,635
<i>Great Britain :—</i>						
Operatives	2,368	13,598	2,094	7,075	4,462	20,673
Administrative, etc.* ...	232	2,537	298	1,614	530	4,151
TOTAL	2,600	16,135	2,392	8,689	4,992	24,824

* Administrative, technical and clerical staff.

B.—OPERATIVES (EXCLUDING OUTWORKERS) EMPLOYED IN ONE WEEK
IN EACH MONTH OF 1930

Week ended	Males and females			Week ended	Males and females		
	England and Wales	Scotland	Great Britain		England and Wales	Scotland	Great Britain
Jan. 18 ...	19,619	1,327	20,946	July 19 ...	20,120	1,331	21,451
Feb. 15 ...	19,854	1,342	21,196	Aug. 16... ..	19,950	1,317	21,267
Mar. 15 ...	19,904	1,334	21,238	Sept. 13... ..	19,695	1,302	20,997
April 12 ...	20,115	1,342	21,457	Oct. 18	19,359	1,314	20,673
May 17	20,329	1,353	21,682	Nov. 15... ..	19,087	1,263	20,350
June 21	20,350	1,350	21,700	Dec. 13	18,778	1,212	19,990
AVERAGE FOR THE TWELVE MONTHS					19,763	1,316	21,079

C.—NUMBERS OF OUTWORKERS AT TWO SPECIFIED PERIODS IN 1930

January			July		
Males	Females	Total	Males	Females	Total
41	7	48	43	7	50

All the outworkers were recorded for England and Wales.

IV. Power

PARTICULARS OF PRIME MOVERS, ELECTRIC GENERATORS AND
ELECTRIC MOTORS

Power equipment	England and Wales		Scotland		Great Britain	
	Ordinarily in use	In reserve or idle	Ordinarily in use	In reserve or idle	Ordinarily in use	In reserve or idle
PRIME MOVERS						
Reciprocating steam engines	1,936	70	—	—	1,936	70
Steam turbines	365	—	—	—	365	—
Internal combustion engines :—						
Gas	726	55	45	—	771	55
Petrol, kerosene, or other light oils ...	—	—	—	6	—	6
Heavy oils	951	370	—	—	951	370
TOTAL	3,978	495	45	6	4,023	501
TOTAL OF PRIME MOVERS INSTALLED	4,473		51		4,524	
ELECTRIC GENERATORS						
Driven by						
Reciprocating steam engines	1,196	—	—	—	1,196	—
Steam turbines	250	—	—	—	250	—
Internal combustion engines :—						
Gas	195	20	15	9	210	29
Heavy oils	420	40	—	—	420	40
TOTAL	2,061	60	15	9	2,076	69
TOTAL OF ELECTRIC GENERATORS INSTALLED	2,121		24		2,145	
ELECTRIC MOTORS						
Driven by						
Electricity generated in same works ...	2,312	22	4	—	2,316	22
Purchased electricity	10,459	1,083	1,567	309	12,026	1,392
TOTAL	12,771	1,105	1,571	309	14,342	1,414
TOTAL OF ELECTRIC MOTORS INSTALLED	13,876		1,880		15,756	

V. Consumption of fuel

Kind of fuel used	England and Wales	Scotland	Great Britain
	Tons	Tons	Tons
Coal used for power*	1,607	—	1,607
Coke used for power	71	—	71
	B.T.U. (Kw.-hrs.)	B.T.U. (Kw.-hrs.)	B.T.U. (Kw.-hrs.)
Electricity used for all purposes :-			
Generated in same works	3,014	11	3,025
Purchased	8,820	1,170	9,990
TOTAL—Electricity	11,834	1,181	13,015

* In addition, 9,573 tons of coal (all in England and Wales) were recorded as used for power and for other purposes, not separately distinguished.